Diversion Effects on Fish Team (DEFT)

Other Issues to be Considered

The following list contains items that should be considered in the context of "Diversion Effects on Delta Ecological Health" and expands on the fisheries effects work completed thus far.

From and ecological perspective, diversions effect the survival of a variety of fish species and other aquatic organisms. In addition to direct species effects, diversions also effect certain ecological processes and habitats, which in turn indirectly and directly effect fish and other aquatic organisms.

These other issues include the following:

- Diversion effects on Delta channel hydraulics
- Diversion effects on sediment transport and deposition patterns in the Delta
- Diversion effects on aquatic food web organisms
- Diversion effects on nutrient cycling
- Diversion effects on residence time of freshwater inflow to the Delta
- Diversion effects on existing shallow water habitats
- Diversion effects on proposed restoration of shallow water habitat
- Diversion effects on exotic invasive aquatic organisms and aquatic plants.

Possible aggregation of these other diversion effects issues follow:

1. Diversion effects on Delta channel hydraulics
   a. effect on sediment transport and depostion
      i. effect on existing shallow water habitat
      ii. effect on proposed restoration of shallow water habitat

2. Diversion effects on residence time of freshwater inflow to the Delta
   a. effects on aquatic food web organisms
   b. effects on nutrient cycling

3. Diversion effects on exotic invasive aquatic organisms and aquatic plants

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Discussion

Diversion effects on Delta channel hydraulics

The diversion effects on channel hydraulics not only influence fish migration patterns but also influence sediment transport and deposition patterns which has a direct influence on shallow water habitats and ongoing and future efforts to recreate shallow water habitat.

It is generally believed that the system is sediment deficient due to the construction of large dams which capture sediments, gravel mining which removes sediment from the system, levees which constrain stream meander and reduces sediment supply, dredging which removes sediment from Delta channels, and hardening of river banks which reduces erosion and sediment input.

Restoration of sediment dynamics in the system upstream of the Delta is an important component of the long-term restoration program. This will support improved habitats (spawning, rearing, migration, shaded riverine aquatic, etc) upstream of the Delta, but will also incrementally increase the amount of sediment reaching the Delta.

Alterations to Delta channel hydraulics may adversely influence the distribution of sediments once they reach the Delta, and diversions may actually remove the finer suspended sediments from the system entirely. Overall, to maintain and restore shallow water habitats and to offset the effects of erosion, the amount of sediment leaving the system must be less than the amount entering.

There is a limited amount of research into sediment dynamics in the Delta.

Particle or mass tracking models may shed some information on the ultimate disposition of finer (suspended) sediments in the Delta.

Diversion effects on freshwater inflow to the Delta

Diversion influences the residence time of water in the Delta. This may an important aspect of the food web. Earlier discussion of this issue with members of the Estuarine Ecology Team was inconclusive. There was limited evidence that during periods of low residence time (high outflow, or high export and minimal outflow) food web organisms did not have enough time to fully mature and reproduce, thus limiting production. There was no agreement that this was a problem.

In addition to residence time, the location of diversion could directly remove foodweb organisms from the system. Again, there was no agreement that this was a problem.

Diversion effects on exotic invasive aquatic organisms and aquatic plants

This is a speculative concern that diversion and altered channel hydraulics may facilitate the establishment of exotic species through reduced outflow and by limiting Delta salinities.

Historically (between 1921 and 1943) maximum salinity intrusion during dry and critical dry years extended up to Ryde, Walnut Grove, or even Courtland. More recently, maximum salinity intrusion has been kept to Rio Vista and lower.

Ecologically, these salinity intrusions may have been important, but we don't really know how this might have been expressed in community structure or ecology. Regardless, State Board standards, drinking water standards, and agricultural water quality drive the location of maximum salinity intrusion. All of which has a direct link to Delta diversions, location of the diversions, amount of water diverted, and timing of diversion.